AUGUST, MDCCCLIX.

THE ZOOLOGIST:

A

POPULAR MONTHLY MAGAZINE

OF

NATURAL HISTORY,

AND

JOURNAL FOR RECORDING FACTS & ANECDOTES

RELATING TO

QUADRUPEDS, BIRDS, REPTILES, FISHES, ANNELIDES,
INSECTS, WORMS, ZOOPHYTES, &c.

THEIR HABITS, FOOD, RETREATS, OCCASIONAL APPEARANCE,
MIGRATIONS, NESTS AND YOUNG.

No. CCVI.

LONDON:
JOHN VAN VOORST, PATERNOSTER ROW.

Price ONE SHILLING.

Mr. Westwood also exhibited several specimens of the insects which injure books and book-bindings, namely, a small species of Anobium with punctate-striate elytra, in the imago state, which Mr. Westwood regarded as Anobium paniceum, but which Mr. Janson thought was not a native species (a question, indeed, of considerable importance); these had been found dead in eastern manuscripts, with many living larvæ, which from their size might fairly be assumed to be those of this species of Anobium: also a Ptinideous larva, which Mr. Westwood had found gnawing the morocco covers of books in his own library, in the same manner as the Lepidopterous larva which he had exhibited at a previous meeting of the Society: also a large Ptinideous larva, found within the covers of a Syriac manuscript, which Mr. Westwood considered to be that of Ptinus fur, as dead specimens of that species had also been found in the same collection of books.

Mr. Smith observed that he had seen the female of Vespa vulgaris on the wing on the 14th of February last,—a proof of the unusual mildness of the season at that period.

The Secretary read the following communication from Mr. A. R. Wallace, Corresponding Member of the Society, dated Batchian, Moluccas, Nov., 1858, intituled

Remarks on enlarged coloured Figures of Insects.

"The practice of publishing highly-coloured figures of insects, more especially of Coleoptera, above the natural size, is so very general that I fear I shall stand almost alone in protesting against it.

"Coloured figures should represent nature in every respect. They should as much as possible take the place of actual specimens, enabling us more readily to determine species than can be done by descriptions, and making us acquainted with the actual appearance of the rare and beautiful forms which are daily being discovered. Insects, it is true, vary very much in size; yet, as a general rule, magnitude is a great assistance, and often an important supplementary character, in determining species. This assistance we altogether lose by enlarging our coloured figures; for not only does it require time to look for the line of size appended to each, and to consider the effect of reducing the insect to that size, but a small and obscure species is often so transformed, by all its delicate detail being brought out and exaggerated, that we may pass it over altogether as something we have never seen, although the identical insect may be waiting for its name in our cabinet. The evil is made still greater by no system being followed. In the same plate we have insects figured of the natural size, and others slightly or very much enlarged; so that in some cases the largest figure represents the smallest of the insects. See White's Cat. of Longicorns in B. M. tab. 6, figs. 5 and 9. An instance of the same anomaly occurs also, I believe, in one of the plates of Longicorns illustrating Mr. Pascoe's second paper in the Transactions of the Society.

"There is also another evil in this unsystematic enlargement of insects,—that we cannot readily check the accuracy of the figures, which must be often very doubtful, as the artist must trust solely to his eyes for the various proportions; whereas in figures of the natural size a fine pair of compasses will both give the principal dimensions accurately, and enable any one in a moment to test their accuracy. Now, though

BRITISH MUSEUM

size may not be, yet *proportion* is certainly an excellent specific character; and it cannot be considered a trifling matter that, by enlarging our figures in no determinate scale, we can no longer use this character with confidence.

"In turning over good coloured plates of an entomological Monograph or of a local Fauna, we may get at once a mass of useful information. We can compare the species with those of our own country, or of any other district with which we may be acquainted, or the species of a new genus with those of an allied group in our cabinet, seeing at a glance their several relations of size, form and colour. But this can only be done if the figures are of the natural size. In the other case we get quite an erroneous idea of the new group or of the unknown Fauna,—erroneous not only as to size, but in form and colour also; for a mass of colour, though of the same tint, strikes the eye more forcibly than a small portion; and in like manner any abnormal form becomes far more striking when exhibited of a larger size than usual. Let any one compare two plates of well-known insects, in one of which all the figures are of the exact natural size (representing actual specimens), in the other variously enlarged (representing nothing in nature), and he will be convinced that the former is in a very great degree more useful and instructive than the latter. It is the difference between truth and error.

"Species which are too small to be well coloured of the natural size should be represented by outlines enlarged in some definite given proportion; and such figures should be given on separate plates, so as to be comparable with each other.

"To make our coloured figures larger than nature has formed the objects which they are intended to represent, in order to make them more showy and ornamental than they really are, is quite unworthy of Science. Such figures do not possess any one solid recommendation, while they do possess many positive disadvantages to the scientific inquirer. They are also likely to disgust the incipient entomologist with his study when he finds that his cabinet can never be so showy as the plates on which entomologists profess to represent his specimens.

"In Lepidopterous figures nature is seldom so falsified. Who ever thinks of figuring a new Erycina or Lycæna so as to equal in size a Papilio or a Morpho? The thing would be scouted as absurd, yet it would be in reality not one whit more objectionable than is the present practice as regards Coleoptera.

"I beg, therefore, to propose that the Entomological Society of London should lead the way in this salutary reform, and allow, in its 'Transactions,' fully-coloured figures only of the natural size, and outlines enlarged in some definite degree which should be uniform for at least all the figures on the same plate."

Several members present objected to the opinions expressed by Mr. Wallace, and Mr. Smith suggested that Mr. W.'s dislike to enlarged coloured figures might arise from the fact that he had never seen any well-executed plates containing such figures.

Mr. W. Wilson Saunders read a paper on some remarkable Dipterous insects from Dory, New Guinea, having long horns arising under the eyes, and projecting forward like those of some of the deer tribe. The specimens were exhibited at the last meeting of the Society, and were sent to this country by Mr. Wallace. Mr. Saunders proposed for their reception the genus Elaphomya, and described five species, *viz.*, E. cervicornis, E. Wallacei, E. alcicornis, E. brevicornis, and E. polita.

June 6, 1859.—Dr. Gray, President, in the chair.

Donations.

The following donations were announced, and thanks ordered to be presented to the the donors:—'The Journal of the Royal Dublin Society,' Nos. 12 and 13; presented by the Society. 'Journal of Proceedings of the Linnean Society,' Supplement to Botany, No. 2; by the Society. 'Catalogue of the described Diptera of North America,' prepared for the Smithsonian Institution, by R. Osten-Sacken; by the Smithsonian Institution. 'List of the Specimens of Lepidopterous Insects in the Collection of the British Museum,' by Francis Walker, F.L.S., &c., Part XVII., Pyralides; by the Author. 'The Zoologist' for June; by the Editor. 'Bibliotheca Historico-Naturalis heraus gegaban,' von Ernst A. Zuchold, Achter Jahrgang, Heft 2; by the Author. 'Boston Journal of Natural History,' Vol. vi. No. 4. 'Proceedings of the Boston Society of Natural History,' Vol. vi. Nos. 11—22; by the Society. 'Eleventh Annual Report of the Board of Agriculture of the State of Ohio,' to the Governor, for the year 1856; by the Board. 'Report of the Commissioner of Patents for the year 1856;' by the Patent Office of the United States. 'The Journal of the Society of Arts' for May; by the Society. 'The Literary Gazette' for May; by the Editor. 'The Athenæum' for April and May; by the Editor. 'The Entomologist's Weekly Intelligencer,' Nos. 137—140; 'A Manual of British Butterflies and Moths,' Nos. 31 and 32; by H. T. Stainton, Esq. 'Stettiner Entomologische Zeitung,' Nos. 1—6; by the Entomological Society of Stettin. 'Fabricia Entomologica,' Part I., No. 3; by the Author, M. H. Jekel. 'Description de la Leptura Militaris,' par M. Aug. Chevrolat; 'Description de Nouvelles espèces de Coléoptères, par M. Aug. Chevrolat; by the Author.

Exhibitions.

Mr. Stevens exhibited some fine examples of both sexes of Papilio Œnomaus, sent from Ternate by Mr. Wallace.

Mr. Stevens also exhibited specimens of Lœmophlæus Clematidis, of which species above a hundred examples had been captured by Dr. Power, Mr. Jeakes and himself, near Gravesend; Stenolophus elegans, of which Dr. Power and himself had secured about fifty, at Southend; and a living example of Hetærius sesquicornis, one of several which he had recently taken near Hampstead, in nests of Formica fusca.

Mr. Janson exhibited specimens of Haploglossa gentilis, found by Mr. F. Smith, in company of Formica fuliginosa, at Hampstead. The species had not hitherto been detected in this country.

Mr. R. B. Were exhibited a specimen of Crioceris merdigera having a transverse lateral black patch on each elytron, which had been recently found in a garden at Homerton.

Mr. Stainton stated that when at Ratisbon lately, Dr. Herrich-Schäffer had informed him of a new Lepidopterous insect frequenting ants' nests, which he had received from the East Indies; and he had been exceedingly surprised to hear that this new inmate of the formicarium was *a butterfly*, apparently of the family Lycænidæ. Dr. Herrich-Schäffer had been assured that this insect made no use of its wings, and merely walked about in the ants' nests, having thick legs, of a peculiar construction, not unlike wooden legs.

Mr. Westwood had little doubt but the butterflies alluded to were the singular insects figured by Dr. Horsfield in his 'Lepidopterous Insects of Java,' Plate II., under the generic name of Symetha (Polyommatus Symethus of the 'Encyclopédie Méthodique' being the type), and having remarkably developed and thick tarsi. This opinion was subsequently confirmed by Mr. Stainton.

Mr. Douglas exhibited the following insects, and notes of their economy:—

"*Ornix Scoticella*, with its pupa-case projecting from its puparium, within a leaf of Sorbus aria.

"*Coccyx splendidulana*, Guén., with its pupa-case projecting from its puparium, in a piece of the bark of a willow, where I found it in March. Mr. Wilkinson, in his 'British Tortrices,' says the imago of this species 'appears among fir trees;' but this does not accord with my experience, and in the present instance there is not a fir tree within half a mile of the place where I found the pupa.

"*Raphidia* ——— ? Last February, when examining, in Richmond Park, the rotten pieces of oak branches blown down by the wind, I found, in the centre of two of them, a larva of a Raphidia. What they did there I do not know; they appeared to have nothing except the wood to eat, but they were very lively. I took them home and put them in a large glass jar, still in the wood; and there they remained till the 6th of May, when I found two perfect insects. Attached firmly by the outstretched feet, was the pupa-skin which I now exhibit; it was in a vertical position, rent on the back where the imago had emerged, and resembled the exuvium of a dragon-fly, such as we constantly see attached to the stems of plants growing in water. The other pupa-skin I could not find. Twenty-five years ago Mr. Waterhouse read a memoir on the transformations of a species of Raphidia, to this Society, and it is published in the first volume of the 'Transactions.' I should not have deemed it worth while to bring the subject again under your notice, only that my observation of the position of the larva goes to prove his supposition that the habit is not carnivorous; and, moreover, I thought it might be of interest to show that, in the instances I noticed, the larvæ were not immediately beneath the bark of solid wood as his were, but in the centre of rotten branches, so rotten indeed that they crumbled beneath the fingers. Possibly they are not the same species as Mr. Waterhouse's. Percheron says the larvæ feed on larvæ of Arachnides and Onisci; certainly mine had no such food after I got them, and as the pupa state lasts, according to Percheron, about fifteen days, mine either fasted two months or fed on the wood.

"*Trinodes hirtus.* The larva I exhibited recently, at a meeting of this Society, has, as I expected, produced an example of Trinodes hirtus. The following is a description of the larva:—

"Length 1½ line. Dirty white; head large, testaceous; second segment narrow, black; each segment is narrowly margined with black, and down the back is a row of black spots. The whole larva is densely clothed with black, stout hairs, arising in fascicles; these hairs are erect on the back, but those along the sides are rather curved; they are shortest at the head and anus, but the longest are more than half as long as the body. The larva is without the dense anal tufts of hairs which are so conspicuous in the larva of *Tiresias serra.*

"The pupa state was assumed about the middle of May, within the skin of the larva, and under the web of the spider in whose company both this species and Tiresias serra live together under the loose bark of old oak trees. The imago appeared on the 3rd of June."

Mr. Stevens communicated the following extracts from a letter received by him from Mr. A. R. Wallace, dated Batchian, January 28, 1859:—

"I had determined to leave here about this time, but two circumstances decided me to prolong my stay—*first*, I succeeded at last in taking the magnificent new Ornithoptera, and, *secondly*, I obtained positive information of the existence here of a second species of Paradisea, apparently more beautiful and curious than the one I have obtained. You may perhaps imagine my excitement when, after seeing it only two or three times in three months, I at length took a male Ornithoptera. When I took it out of my net, and opened its gorgeous wings, I was nearer fainting with delight and excitement than I have ever been in my life; my heart beat violently, and the blood rushed to my head, leaving a headache for the rest of the day. The insect surpassed my expectations, being, though allied to Priamus, perfectly new, distinct, and of a most gorgeous and unique colour; it is a fiery golden orange, changing, when viewed obliquely, to opaline-yellow and green. It is, I think, the finest of the Ornithoptera, and consequently the *finest butterfly in the world?* Besides the colour, it differs much in markings from all of the Priamus group. Soon after I first took it I set one of my men to search for it daily, giving him a premium on every specimen, good or bad, he takes; he consequently works hard from early morn to dewy eve, and occasionally brings home one; unfortunately several of them are in bad condition. I also occasionally take the lovely Papilio Telemachus, *n. s.*

"I have sent off a small box containing four males, one female, and one young bird of the new Batchian Paradisea, besides one red-ticketed private specimen; six males and five females of the new Ornithoptera, and seven Papilio Telemachus.

"Tell Mr. Gray and Mr. Gould that the Paradisea had better not be described yet, as I am making great exertions to get the second species, evidently of the same genus, which will enable a generic character to be more accurately given. The butterflies, I trust, will be both figured, male and female, either in Mr. Hewitson's book or in Ent. Soc. Trans. For the Ornithoptera I propose Crœsus as a good name. Butterflies are scarce; good beetles turn up occasionally, but nothing very grand. I have now a handsome series of Buprestidæ, and a remarkably pretty lot of Longicorns; one of my last acquisitions is a grand bronzy Tmesisternus, 1½ inch long, a single specimen only. In almost all orders, and in birds, there is a deficiency of species; yet there are so many pretty and brilliant things, and a few so grand and new, that on the whole I am inclined to think my Batchian collection will be the best I have made anywhere.

"Another reason which may induce me to stay perhaps two or three months longer at Batchian is that I have had no fever here, which I have never been free from two months at a time for the last two years before; and I may therefore hope to get my health well established for my next journey to New Guinea.

"The butterflies will make a show-box which will, I think, be admired almost as much as the birds of Paradise."

Mr. Westwood observed that he had little doubt the male Ornithoptera of which Mr. Wallace had given such a glowing description, in the letter just read, was the Ornithoptera Tithonus of De Haan, figured on the first plate of his fine work on the 'Insects of the Dutch Settlements,' the hitherto unique specimen of which is in the Leyden Museum, and was seen by Mr. Westwood on his visit last year; he had also little doubt that the female would prove to be the O. Victoria of G. R. Gray, figured, some time since, in the 'Proceedings of the Linnean Society,' from a specimen taken by Mr. M'Gillivray in one of the islands of the Eastern Archipelago, and now in the British Museum collection.

Mr. Shepherd thought, with Mr. Westwood, that Mr. Wallace's description agreed with O. Tithonus, but considered it hardly possible that Mr. Wallace was not acquainted with De Haan's figure. Previous to leaving this country for the East, Mr. Wallace had carefully investigated the works containing descriptions and figures of the entomological productions of the countries he was about to visit; and it seemed almost incredible that he could have overlooked or forgotten this fine insect.

Mr. Baly read a paper on new species of Phytophagous insects, together with the characters of a new genus, Paralina: this latter is closely allied to Lina and Chrysomela, and is separated from these genera on account of its produced meta-sternum, which, passing forwards between the meso-coxæ, articulates with the base of the prosternum, entirely concealing the meso-sternum; its type is Lina Indica, *Hope.*—*E. S.*

The Crab and its Allies.

By C. Spence Bate, Esq., F.L.S., &c.

(Continued from p. 6578.)

It will be here, perhaps, desirable rapidly to review the nervous system of the Crustacea.

The symbolical Crustacean consists of twenty-one segments, every one of which carries a pair of limbs. The nervous system that supplies these segments and their appendages consists of a series of ganglia, one being lodged in each successive segment, and connected to each other by two parallel nervous cords: the whole of these lie close to the ventral surface of the integument and beneath the organs of the body, except the three anterior pair, which supply organs of sense; these are situated above, or, rather, I should say before, for the oral aperture is situated in the fourth segment; they give off threads to the members and other organs: the more important parts are supplied from the ganglia; those of less consequence receive their supply from the intermediate cord. Though this is the type of the nervous system, yet in no known Crustacea is it found exactly to correspond. In all there is a tendency of the ganglia and the corresponding segments to fuse with each other; this is of a degree more or less in different species or groups; thus, in the sessile-eyed Crustacea all the ganglia are distinct except the seven anterior; the three first form one, the supra-œsophagal ganglion, as it is named; the four succeeding build up the infra-œsophagal, which are so called from their relative position to the alimentary tube. But this fusion, which here embraces but four ganglia, in the higher types embrace as well the seven succeeding. This is more or less perfect in its completion in different animals. In the Macroura, that is the lobster, the long-tailed order, the union of these several ganglia (according to Edwards) form one long ganglion, like several in conjunction; but in the Brachyura, or short-tailed species, they are more perfectly formed into one large ganglion; and the only difference observable between the nervous systems in the swimming and the spider crabs consists in there being a hollow space in the centre of the large ganglion, or mass, in the former, whilst it is filled up and solid in the latter. It has on this account always been orthodox, from Edwards and Audouin, who first carefully described the nervous system of Crustacea, down to Dana, the latest who has written systematically upon the subject, to consider that of the spider crabs as being the most perfectly fused, and therefore highest in grade.

But it should be remembered that that which gives rank to all animals is the greater or less degree of its intelligence and instinctive force. All consciousness of power and existence in animals comes through the senses, and the organs endowed with the capability of sensation are supplied by nerves that come directly from the brain. We have, then, *à priori*, a right to assume that those organs which are similarly endowed in the lower forms are supplied by nerves that proceed from an organ which represents the seat of consciousness; and although it bears no resemblance to a brain, and in fact is scarcely more if as important as the other ganglia of the body, yet must be analogous to a brain. The antennæ and the eyes receive their supply of nerves from the first or supraœsophagal ganglion, which is the result of an union between the three most anterior ganglia, and which are only separated in the Squilla, where the anterior segments are not fused with the carapax.

The antennæ and the eyes are known, from external evidences, to be organs of sensation, and therefore the mass from which their nerves originate must be endowed with the capacity of receiving impressions derived through those organs; therefore it must be the seat of consciousness. The more perfectly endowed the animal may be with conscious power, the higher we should esteem its rank among animals; and in dissecting for the purpose of verifying this hypothesis, we should anticipate a greater or more perfect development in the appearance of those ganglia that supply the organs of sense, with or without a corresponding degree in that of the other parts of the nervous system.

It is the opinion of many naturalists that there is no analogy between any of the ganglia of this class of animals and the brain of the higher forms; that in fact these animals live with scarcely a consciousness of their existence; that their nervous system represents only the spinal cord in the Vertebrata; — thus depriving the animal not only of feeling, but, as it seems to us, of all those powers which make existence an enjoyment; for the arguments that are made use of to prove the deficiency of any one faculty must possess the same amount of importance in relation to the others.

It is a pleasant thing for the naturalist to believe that the animal he wishes to impale in his collection does not, upon being killed,

> "Feel a pang as great as when a giant dies."

No doubt but that feeling, as every other sense, is much reduced, and that a Crustacean cannot hear, taste or smell as animals endowed with a higher nervous system; but it is hard to believe that pain is unknown to this class of animals; and against the hard negative evidence deduced from a study of the structure we must place that which is demonstrable from the habits of the living creature.

It is true that certain animals, as the ant and the wasp, may lose the body without, apparently, being conscious of the fact, and go on without interruption in their present occupation. I have a friend who was shot in the excitement of a naval engagement, the ball entering near the waist and traversing the circumference of the body just beneath the skin, and who was not aware of the circumstance until he grew faint from the loss of blood. No one, I presume, will argue that therefore he was not susceptible to pain.

The crab will, upon receipt of an injury in any of its limbs, throw off the whole member, that a new one may grow: are we therefore to infer that it suffered no pain from the original wound, or in the amputation because the act is voluntary? but rather should we not insist that it was suffering that induced it to inflict the otherwise rash act of mutilation? That this is the case, we may infer the more decidedly from experimental evidence. In order to make observations I procured a number of young crabs. These I used to treat often unkindly. I would, with a pair of scissors, cut off a leg or an arm; but the animals were very adroit, as if they knew of my intention; and hard work I had to catch a limb between the savage blades, and when it was there it would frequently escape again before the blades were closed. Immediately the limb is injured it is thrown off by a violent muscular contraction at the joint second from the body of the animal; it is then struck against some foreign substance, and belongs no more to the creature. Simultaneous with this operation, a thin membrane of chitine is generated upon the surface, and it is not impossible that this may be the amputating means. The entire act is one of a few seconds only, except when they have but recently cast the old shell; while the new one is soft and yielding it will remain attached sometimes for half an hour, but this attachment I presume to be merely mechanical, the organic union having been, internally, previously severed.

In carrying out these experiments I once cut the claw of a crab so as to remove only part of the thumb and finger. The limb was not rejected, and when the shell was cast the hand continued maimed, and never was reproduced. I well remember that immediately after the injury the poor thing raised up its wounded arm and fled from the scene of danger; and when it had gone as far as the prison would permit, it with the other hand cautiously felt the wound; and then repeatedly, for some time, gently stroked the arm between the fingers of the claw, and, as much as it was possible to express pain, showed that it was suffering. It is easy to say, and perhaps demonstrable theoretically, that the nerves which give an expression of agony are not those which convey the sensation of pain; but a reflex action seldom occurs in ourselves without a previous sensation of pain.

Philosophy teaches us that pain is no evil,—that it is sent as a monitor to instruct us as to the health or disease of any part of the body. But surely it would be unphilosophical to teach that the same law holds not its place in relation to the lower forms of animal life, because they are less dependent upon external curative treatment; and certainly the fact of the self-amputation of a limb, because it is wounded, is evidence of the value of pain, since it is an operation that we could never suppose any animal to perform unless it instinctively felt that it would remove a greater evil, just as is the case in man when he extracts a tooth to relieve himself of a severer pain.

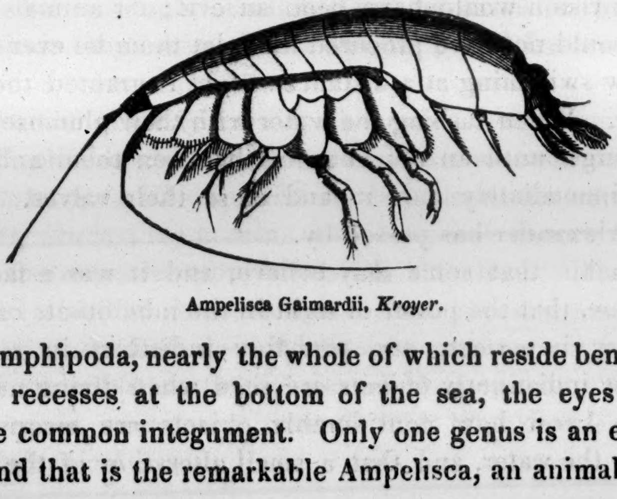
As before remarked, the arguments which are made use of to prove the animal cannot suffer pain must also have force in relation to the senses. Pain is no independent sense: it is only a modification of touch, in the same way as acute hearing amounts to suffering; and no one doubts that these animals can see, hear and smell, and that they have especial organs for the purpose.

The sense of sight may not be as definite in the Articulata as it is in man, but there is every external evidence to demonstrate that the organ of vision is perfect in its adaptation, and as perfect in its youngest stage of development as in its complete form. The eye in the larva of a crab appears by far the most important organ that it possesses, being considerably larger in relation to the animal than in the full-grown crab.

I have not ascertained the circumstance in the pedunculated orders, but it is a fact in relation to the sessile-eyed Crustacea that the organ continues to grow, that is, the number of lenses in the visual organs continually increases with age, and that a considerable number is present to build up one eye; in the young amphipod there are from eight to twelve, in the adult there may be from fifty to sixty; but in the crabs and lobsters there are a great many more; the quantity being required to counteract the want of more perfect movement and the position of the organ.

It was on this class of animals that Divine Will first manifested his power, in the construction of these organs; and though ages, which the mind wearies in attempting to calculate, have since passed away, the plan of the organ is still the same; it differs not more than specifically from that of recent Crustacea. It evidently, in the Trilobites, from its position, belonged to an animal that was always groping at the bottom of the sea, for its vision was limited to things that were situated above it; and that it frequented shallow water is also demonstrable, from the limited extent of its upward range. In the pedunculated order of recent Crustacea the range of vision is more extended, and is also rendered more complete from the fact that the organ is raised upon foot-stalks and moveable; but still the power of vision appears most complete in the centre of the organ. Upon the inner surface of the eyes there are no lenses placed; thus all objects between them are less distinctly seen. To overcome this circumstance as much as possible, and also to keep guard more watchfully, the eyes are as in the timid hare, keeping especial look-out behind. The common shrimp has often allowed the hand to come quite close to it, when the action is made in front, before it observed the circumstance; but will dart away long before if an attempt be made to steal near it from any other quarter. In comparing the present with the past, the most recent with the most ancient, there appears no change of purpose; the organ that was found to be adapted for the primeval waters is equally available for the ocean of the present day; the first-created eye and the last are alike complete and perfect in their adaptation to the class of animals to which they belonged, even though it may bear, as the Trilobite to the recent Crustacea, in general structure, the most distant analogy of parts, and as an animal has itself passed out of the list of the living.

Among mammals we find the organs of vision adapted to the peculiar wants of the animal. The mole, which burrows where but little light can reach, possesses a very small eye. This regulation is also carried out among animals of the lower order. Some of the shrimps are known to live deep in the mud and sand, and some amphipods dwell in dark underground wells. The Thalianassa which was found by Colonel Montagu at the mouth of the Kingbridge river inhabits passages in the sand at the depth of a foot or more; the Gebia, also a closely-allied genus to the last, dwells in the mud; and in Plymouth Sound, Dr. Leach has excavated individuals, and found their subterranean passages to extend in a horizontal direction often to the length of a hundred feet or more; the Callocaris Macandriæ is stated by Mr. Bell to be fossorial at the depth of eighty fathoms. Positions such as these, we should suppose, must render the eyes useless as organs of vision; we therefore find that in these and similar-dwelling Crustacea the eyes are reduced to a rudimentary condition; and to such a degree in nature has this fact become constant that we are fully justified, upon finding an animal the habits of which are unknown, with but imperfectly-developed organs of vision, to infer that they are generally so placed as not to require their use. An instance may be given in one of these forms that is figured in Dana's great work on Crustacea (Cryphiops spinuloso-manus), where the eyes are placed so far back beneath the carapax that they cannot be seen until a considerable portion of the latter be removed. We can scarcely doubt that in its natural state this animal is subterranean in its habits.



Ampelisca Gaimardii, *Kroyer.*

In the Amphipoda, nearly the whole of which reside beneath stones, or in dark recesses at the bottom of the sea, the eyes are lodged beneath the common integument. Only one genus is an exception to this rule, and that is the remarkable Ampelisca, an animal apparently with four eyes. Without doubt there are four distinct lenses, two to each eye; and these are placed at the extremity of each organ, and implanted in the integumentary structure; from which we may assume that an arrest in the number of lenses takes place at an early stage, and that in the Ampelisca they do not increase in number, as is the case in the Amphipoda generally.

The distinction of the character of the eye in the Amphipoda and Isopoda from that of the Decapoda appears, in an anatomical point of view, to rest chiefly upon the peduncle being absent in the former, rather than to any definite alteration in the eye itself; and by no means is it the test of any inferiority on the part of the animal. This appears to be easily demonstrated by the fact that in all the Diastylidæ the eyes are sessile, and converge into a single organ; this is the case also with some of the Entomostraca; but, on the other hand, the genera Tanais, among the Isopods, and Nebalia and Artemia, among Entomostraca, have the eyes supported upon foot-stalks, in a manner corresponding with the decapod Crustacea.

The eye appears to be designed to suit the want of the animal, and is developed according to the habits of the creature, being more important in those which are erratic and swim about in the light, as Nebalia and the Macroura. Take a prawn for instance, and see, in the vivarium, how it will gracefully swim about in search of food; and if you are in the habit of feeding it, as one which I recently noticed in the possession of Dr. Dansey, it soon becomes very tame, and knows the stick that hands its food to it, which as soon as it perceives comes over to it. But to those animals which are so situated that eyes can be of no use, as the fossorial Crustacea, whose residence is in the dark; or, again, as to the barnacle tribe, which reside in the light, perfect vision would have been an evil; for animals stationary as they are could not have procured food, let them be ever so hungry, that they saw swimming at a distance: sight is granted them only to avert danger. When lashing the water with their plumose cirri, they know no danger until an object swims between them and the light, when they immediately dart in and close their valves. Diogenes waits until Alexander has passed by.

It is probable that some may believe, and it was a fancy of my own for a time, that the power of sight in the inhabitants of the water must be very imperfect, and probably indistinct in outline. I recollect how indistinctly objects are seen when diving under water, but we also know how considerably objects are magnified when seen through the water, and that a small alteration of the convexity of the several lenses would greatly perfect the adaptation of the organ to the medium in which it exists. We may therefore fairly infer that, in common with the universal scheme in nature, the organ is as fully adapted to see objects distinctly in the water as other animals see things on land; and thus, to all, the endowment is made a blessing. Divine love has ruled this a paramount law, and nowhere do we see it more forcibly exemplified than in the organs of vision of the Cirripodia. Whilst they are young, and swim freely in the water in the full light of day, and have to seek out and choose their own permanent place of rest, they have distinct eyes, although in the earliest form the two are confluent, and appear as a single organ. In a second stage they increase in size, and separate; but directly the animal is fixed to the rock, and shut up in his shelly cavern, the organs are not to be seen, and eyes, really as such, probably do not exist, although careful dissection first demonstrated, by Prof. Leidy, in the Balanus, or sessile group of barnacles, and since by Mr. Darwin in Lepadidæ, or pedunculated family of these same Crustacea, that the ophthalmic ganglion is present in the adult form. Thus the animals appear to be endowed with a low power of vision, which probably does not reach beyond the consciousness of objects that may interfere with the rays of light that pass into the shelly entrance.

We have repeatedly noticed them throwing their cirri with the unerring constancy of clock-work, until a hand be moved in front of their small opening, when they immediately retract themselves, and shut up their valves until the supposed danger has passed away; but beyond this, sight can be of no use to them. No animal but man is supposed to enjoy the beautiful in nature; sight, therefore, is only valuable to animals to seek food and avoid danger, and it is only in the latter sense that it can be available to the barnacles in their adult character, since they are anchored to a rock and have no power to move.

But the barnacle family are not the only Crustacea in which the organs of vision are reduced to a rudimentary condition. Some of the parasitic Isopods take up their abode beneath the carapax of the higher forms, where they become a disease, and distort the fair proportions of the creature upon whose life they feed. The females of Bopyrus and allied genera are found upon crabs, shrimps and barnacles, where they feed and vegetate to such an extent that they outgrow all resemblance to the normal character of a Crustacean; whereas the male, which continues through life an active individual, preserves the typical form.

The relation of one of these to Balanus balanoides, with which it is found associated, was mistaken by Mr. Goodsir for the male Cirripodia, but which Mr. Darwin has shown, from the hermaphrodite character of the latter, must be a parasite inhabiting the shell. The females of these genera appear to be quite blind.

There are parasites among Crustacea the eyes of which appear to be monstrously developed, as in some of the Hyperidæ; but this is no evasion of the general scheme, that the organs of vision shall be in accordance to the wants of the animals. Hyperia Galba and many others take up their abodes within the transparent Medusæ, and swim the clear surface of the broad ocean, floating in their balloon-like cars. These, though parasites, live in the clear effulgence of the day, but which must be lessened in degree, independent of the passage of its beams through the water, by the interference of the tissues of the animal, in the hollow chambers of which they reside. The eyes of Hyperia are large, and embrace in compass nearly the whole of the head of the animal; the colour is of a pale and delicate green. But under whatever colour or circumstances perceptible, the organ seems developed in a proportion best suitable to the wants of the particular being it gives light.

When the range of vision is required to extend far, the eye is carried upon foot-stalks, and these, in some species, are not much less important than the legs of the same animal, as in the exotic genus Podophalmata, and in the beautiful little translucent stomapod, the Philosoma of the temperate ocean.

Sometimes they are lodged beneath the integuments; and, again, they are brought so near together that they converge into a single organ; and in some they appear to be wanting, though this is probably owing to the absence of a coloured cornea. But, wherever the eye is placed or formed, it holds, homologically, the same position throughout Crustacea, and must be looked upon as first of a series of members formed to suit peculiar conditions; one is developed to act as a leg; another to assist in swimming; a third is formed so as to be useful as a mandible. Under all these various changes the appendages are to be seen, each one adapted for an especial use; thus, the eyes are but tactile organs, modified so that the nerves may receive impressions of light, just in the same way as we may suppose an extended arm would hold a ball, or, to speak more correctly, the hand itself be converted into an eye-ball.

(To be continued.)

A List of the Birds of Banffshire, accompanied with Anecdotes.

By Thomas Edward.

(Continued from page 6601.)

Crossbill (*Loxia curvirosta*). Of late years the common crossbill has either become more plentiful or observers more numerous, or perhaps partly both. Twenty years ago the bird was considered a rarity; but this is not so much the case now. It is now believed that they nest with us, and have done so for some years. There is great diversity in colour and size amongst these birds; of about two dozen which have passed through my hands not two were alike, either in size or colour, although from the same flock.

Parrot Crossbill (*L. pityopsittacus*). While walking, one morning, round the fern-hill (whin-hill), and just as I reached the south side, I was rather surprised at hearing the voice of what I knew to be a stranger in that quarter, and in fact within our limits altogether. On looking to a low, bare wall, about three or four yards in front of me, I beheld, in all his pride and beauty, a male parrot crossbill. This is the only instance, to my knowledge, of its occurrence with us.

Whitewinged Crossbill (*L. leucoptera*). One very stormy winter, about fifty years ago, the good lieges of our quiet little borough were rather astonished by the presence of a large flock of these birds. Having alighted on what are termed the "Castle trees," their strange appearance and gaudy plumage soon attracted notice, nearly the whole town flocking to the spot to see the "foreigners." They appeared quite exhausted, many of them dropping from the trees.

Starling (*Sturnus vulgaris*). More numerous now than they were some years ago. There are many places throughout the country where they now breed annually, in holes in trees and old buildings.

Rosecoloured Pastor (*Pastor roseus*). This is another rare beauty whose presence we can boast of, a male having been shot in a garden at Ardmellie. It was a most splendid specimen, and in first-rate plumage.

Raven (*Corvus corax*). A few pairs of these birds inhabit the precipitous parts of our coast, where they breed, generally in company with the falcon, kestrel, gull, guillemot, &c. Single pairs are to be met with also in other parts of the country. A pair and their descendants, but never more than a pair at a time, frequented and bred for many generations on a particular rock in the crags close to the bridge of Alvah, a most beautiful and romantic spot. From some cause or other, however, they have long since disappeared, and are not now known to visit the place. The raven will tame pretty well, and become very tricky too if you like. One which I kept had such a predilection for interfering with water, that he could not see a pail or tub containing any without attempting either to capsize it, or render the water useless by throwing in all sorts of filth and stones he could lay his beak on; this done, he would give a few croaks, and retreat to some convenient spot out of harm's way. And as for thieving, he was a perfect devil. But everybody liked him, despite his mischievous pranks. One kept by a person here was just such another: he stole everything he could carry off, and when his retreat or nefarious repository was discovered it contained more than a barrow full of miscellaneous articles. A bonnet or a cap was a most glorious prize. You had no more to do, if you saw a boy passing, than to whisper to the raven "bonnet" or "hat," as the case might be, when off he would go to the boy's back, and soon possess himself of the article, which not every little chap could retake. In a part of our town called Gallowhill there once lived a bit of a character called Robert Rhynd, but more commonly Rob Rinn, a shoemaker, who gained for himself the cognomen of "Boots," simply because he wore those articles, and delighted in having them always very clean. But he did'nt like the name at all, in fact he could not bear it, and well did the youngsters of the neighbourhood know it, and many were the battles he had with them; and to throw dirt of any sort on his boots was just as bad. At this time another individual, of quite a different stamp, and one which the mischievous portion soon initiated into the secret of "Boots," came to live in the same locality; and so artfully did the new comer perform his work that the poor snob could not leave his house without being instantly assailed by a hoarse, croaking sound of "Boots, Boots, Boots;" and if dirt could be got, it was a rare case if Rob did'nt get his boots bespattered before he got home again. It was in vain that he swore and kicked: the raven was too bold for him. It pleased the urchins to the very heart to see the bird and Rob in a fix. The boys he chased; the bird he could make nothing of. At length, however, the raven, during some of his wanderings about the place, by mere chance got upon the top of a wall, where, through a window, who should he espy but his old friend hammering away at a piece of leather. This was too much to let slip. Habit is a terrible thing. Round he turns fairly in front of the window, becking and bowing, and croaking out "Boots, Boots." "Aye! ——!" roared our friend, maddened at the seeming impudence of the bird, "I'll 'boot' you!" With that away flew the hammer right through the window, —glass, frame and all,—and, hitting the unsuspecting creature on the head, felled him to the ground, a corpse.

The Carrion and Hooded Crows (*C. corone* and *C. cornix*) seem to be in about equal numbers, not very numerous. They appear also to associate together, in winter as well as in summer. They are to be found in certain parts of our coast all the year round. Many of them breed there; others retire inland for that purpose. Our keepers destroy them whenever opportunity offers. I wonder that our fishermen do not do the same, considering that they destroy great numbers of a certain Crustacean, namely, Carcinus Mœnas, which is sometimes used as bait. One would almost think that Mr. Crab's head would be proof against black-neb. But no; and what he cannot manage below he goes up aloft with. What! to break the shell against the edge of a cloud? O no; but to let poor crabbie fall on some stone or rock, chosen for that purpose. If one topsyturvy does'nt do, up he goes again: another summerset, and still not smashed. Up he goes a third time, and I have seen him a fourth, but this is rarely the case, the first or second generally doing the work of destruction. When once a convenient stone or rock is met with, these birds resort to it for a long time. I myself know one, a pretty high rock, which has been used for this purpose for the last twenty years; I don't say by the self-same birds, but it has been used for that period, and perhaps considerably longer. Besides being fond of crabbie, they are very partial to the finny tribes, and, though very good fishers themselves, very seldom if ever lose an opportunity of assailing the heron when he has had the good fortune to make a prisoner. I have seen them watch him intently, and, as soon as a successful dive could be made, rush upon him; and if the heron did not instantly swallow his prize, he was almost sure to come off second best, with a good teasing to boot. I have also seen the heron attacked when on his way home in summer time loaded with food for his family.

Early in the summer of 1845, whilst loitering about the hills of Boyndie, I observed a heron flying heavily along in a direction as if passing from the sea, and seemingly well stored with provisions from that rich and inexhaustible magazine of nature, and at the same time pursued by a carrion crow, followed at some distance by two magpies. They had not proceeded far when two hooded crows made their appearance, and quickly joined their black associate in his attack on the heron. The heron had by this time got into an open space between two woods, and it would appear to have been the determined intention of his opponents to have kept him there until he should satisfy their demands. During the whole time that the affray lasted, nearly half an hour, they did not suffer him to proceed above a few yards in any way, either backward or forward; his principal movements being ascending or descending alternately, in order to avoid the assaults of his pursuers. They having chosen their battle-ground, as it were, near to where I was, and being sanguine in my hopes of enjoying a rich treat, I concealed myself behind a whin-bush, where I had an uninterrupted view of the whole affair. I was very much gratified in having my expectations realised to the fullest extent. The battle might now be said to have been fairly begun; and between the sonorous screaming of the heron, the cawing of the crows, the chattering of the magpies, who were hopping on the ground beneath the scene of action, we had a most inharmonious concert. The manœuvring of the crows with the heron was most admirable; indeed their whole mode of procedure had something in it altogether very remarkable; and so well did each seem to understand his respective position, that the one never interfered with the other's point of attack. One rising higher than the heron, descended upon him like a dart, aiming the blow in general at his head; another at the same time pecked at him sideways and from before; whilst the third assailed him from beneath and behind. The latter several times, when pecking at him from behind, seized hold of his feet, which, being extended at full length backwards, formed a very prominent and tempting object for the crow to fix on. This movement had the effect each time of turning the heron over, which was always the signal for a general outburst of exultation amongst the three black rogues, manifested by their much louder and complacent cawings and whimsical gesticulations, no doubt laughing (if birds can laugh in any way), after their own fashion, at seeing their victim turning topsyturvy in the air, which, from his unwieldly proportions, exhibited, before he could get himself righted again, a rather comical scene. During one of these summersets the heron disgorged something, but, unfortunately for him, it was not observed by any of the crows, and on its falling to the ground was set upon and soon devoured by the magpies, which were still there in attendance. Finding no relief from the dropping of the article, and being still hard pressed, he again disgorged what appeared to be a small fish. This was noticed by one of the hooded crows, who speedily secured and made off with it, and quickly disappeared, leaving his two less fortunate companions to fight the battle out. The heron, having now got rid of one of his pursuers, seemed, from his appearance, determined to push his way forward in spite of all opposition. But this was not to be so easily done as Mr. Heron had anticipated; for his assailants, apparently either from being disappointed of the aid of their comrade, or beginning to get irritated at the length of the struggle, recommenced their attack upon him with renewed vigour, and so artfully did they manage that they kept him completely at bay, and baffled all his endeavours to get away. Wearied at last of the contest, he once more dropped something, which from its length appeared to be an eel. On its being observed by his opponents they quickly followed it. In their descent they fell a-fighting with each other; the consequence of which was that the eel, falling to the ground previous to either of them, was set upon by the magpies, who were very loth to give it up when the crows arrived. Of course a battle amongst the four was the result. The magpies were soon repulsed. The crows now seized hold of the eel with their bills, and kept pulling it from each other until it eventually broke in two, when, each still keeping hold of his portion, they rose, and were soon lost sight of amongst the trees. On looking again for the heron I was just in time to behold him far in the distance, ere he disappeared from view, winging his flight with unusual rapidity, apparently little if any the worse for the fray.

On another occasion, when passing along the Green Banks, my attention was attracted by a loud and clamorous noise. On looking in the direction of the same I observed, upon a bank on the opposite side of the river, a heron, surrounded by a very large crowd of black-nebs, composed of hoodies, rooks and jackdaws, which were making the noise alluded to. The hoodies were shouting at the distance of a few feet round about the heron, every now and then bowing and cawing very politely to him; whilst he appeared, from his haggling, to be somewhat puzzled as to how he could manage to swallow a fish, which was still alive, and which from its breadth I considered to be a flounder. The crows began to press rather near; and the heron, not wishing to be so closely beset with so many of the black gentry, and perhaps dreading that an attack was about to be made upon him, very cautiously placed one of his feet upon the fluke, and, raising his head, surveyed his sable neighbours with a keen and distrustful gaze. Being satisfied, he suddenly sunk from view, but presently reappeared with the fluke in his bill, and betook himself to flight, followed only by two of the hoodies.

wending his way up the river, pursued by these two, which teased him very much, and made several unsuccessful attempts to snatch the fish from his mouth, he passed over the bridge and alighted on an embankment a little above it, the two hoodies taking up their position at the distance of a few yards. The heron stood quite erect, and, after having for a few minutes eyed his two attendants with a haughty look, dropped the fluke, which he had hitherto held in his mouth, on the grass, and, with a significant nod of his head, turned and bowed to the hoodies, which was tantamount to saying, "Come and take it now, ye black rogues." The invitation not being accepted, craigie thought it proper to take it up again himself, and after a good deal of labour and not a little difficulty, caused by the breadth of the fish, he succeeded in putting it into his stomach, when he again took to wing, and was hotly pursued by the hoodies, which pecked at him more furiously than before. But, as bad luck would have it, a keeper, chancing to pass that way at the time, soon put an end to the squabble by shooting one of the crows, the other sneaking off when he saw his companion fall.

Reclining on the beach, one afternoon, near to where the burn of Boyndie falls into the sea, admiring the manners, but more particularly the tameness of a flock of sanderlings, the greater number of which were chasing each other to and fro in seeming sportive play, and uttering their merry notes of "peak, peak, peakie chur;" while others were enjoying themselves bathing in a shallow pool which had been left in a hollow of the sand by the previous tide, the remainder being employed probing with their bills the soft sand round the margin of the pool, in search of marine insects;—a gun was fired by some person close by, which had the effect of raising, from the rocks in my vicinity, amongst other birds, a heron and several carrion and hooded crows. The heron winged his flight, and was closely pursued by three of the crows, in the direction of the rocks situated a little below the "Red Well," and made as if he would have alighted on them, but from some cause or other he did not do so. Turning abruptly round, he came back nearly in the same path, and, passing over the rock he had first left, bent his course eastward, pursued now only by one crow, which pecked at him with such fury that he kept him screaming almost without intermission. Having my attention withdrawn for a few minutes, I was surprised, on again looking towards them, at finding that the progress of both had been suddenly arrested, being still only a short way off. The crow was attempting to pick something out of the sea, whilst the heron was hovering round and round a little above him. Whether it was anything dropped by the heron to get rid of his tormentor, or some other article of food floating on or near to the surface of the water, which had attracted the eye of the crow, I cannot say, but I suspect the former. The crow, after making a number of unsuccessful attempts to pick the object of his solicitude out of the sea, had just succeeded in getting hold of it with his bill, when I observed the heron suddenly ascend close upon him, and, stretching out his long neck, strike the crow on the back with his strong bill, and with such force that poor hoodie had only time to cry out "caw" once before he fell plump into the sea, right over head and ears. It seemed to me that the heron's only motive in hovering about the crow was to get him into the water; for no sooner was it done than he rose again a little higher, and, doubling his neck again on his breast, pursued his way as unconcernedly as if nothing particular had happened, leaving the crow to get out of the briny dilemma he had unwittingly brought himself into the best way he could. The crow, emerging to the surface of the water, and having somewhat recovered from the effects of the blow, and no doubt not feeling at all comfortable in his new situation, began to sprawl furiously about, with the view of getting out of the watery element. But, unfortunately for him, his feathers had absorbed too much moisture, which for a time rendered his wings entirely unfit for flight, so that he could not rise out of the water. Although the sea was comparatively smooth, still there was what is generally termed a rough jabble inshore; and the crow, instead of turning his head, as water-birds would have done, to the waves, turned his tail; the consequence of which was that each successive wave tossed him over, and frequently submerged him for a time. Growing wearied at length with exertion, he became quiet, and resigned himself to the mercy of the waters. The wind and tide being both in his favour, he eventually got landed on a rock at some distance from the shore, surrounded by the sea, and, having scrambled to the top, he shook himself heartily, making the water fly from his feathers in every direction. Marching about on the top of the rock, the beams of the bright sun shining with unclouded lustre upon him, he was, from his glistening appearance, an object of curiosity to people passing on the shore at the time. He also attracted the attention of a few of his own brethren, who, alighting on the rock beside him, began to caw and bow to him, which made me conclude that they were congratulating him on having escaped a watery grave.

THOMAS EDWARD.

(To be continued).

Warbling Parraquet (Melopsittacus undulatus) *breeding in England.*—In the first place, the cage was a large, common breeding one, such as is used for canaries, with boxes at the ends, which are entered by round holes, so as to form as nearly as possible the hollow of a tree. I put into the cage several different kinds of materials, such as moss, feathers, hair, dried grass, &c, the same as we give other birds, hoping that they would build with them; this, however, they did not appear at all inclined to do, but, on the contrary, tried hard to push out what little I had put into the boxes; therefore, finding the eggs were likely to get laid upon the bare boards, I took a pair of scissors and cut up the above-mentioned materials quite fine, so that the birds could not get them out; and this was all the nest they had. The first egg was laid on the 1st of March, the second on the 3rd, and so on every other day until there were four eggs. The hen began to sit when the second egg was laid, and continued to do so until the 18th of March, when the first bird came forth, and so on, in the same succession in which the eggs were laid, until the four birds were hatched. I fed the old ones entirely upon canary-seed, as I had always done; and all the young ones appeared to grow and do extremely well till the 22nd of April, when one died, and another on the next day. I am quite unable to account for this, as they had invariably appeared so healthy up to that period; but I fancy they were seized with cramp in their legs. The eggs were perfectly white, and about the size of a canary's. The young are very much like the parent birds, but the plumage is not quite so bright at present. The hen laid altogether nine eggs, in the same rotation as at first, but did not sit again, and I am sorry to say died on the 19th of May. The two young ones I have left are, I hope, a pair, and with their father are now in good health, and I trust will continue so, and that I shall be more fortunate next year with them.—*Eliza Anne Eeles; Southwold, July* 1, 1859. [*Communicated by John Curtis, Esq.*]

Suggestion as to the Eggs mentioned by the Rev. J. C. Atkinson. — I do not for a moment doubt that the eggs mentioned by the Rev. J. C. Atkinson (Zool. 6563) belong either to a missel thrush or a blackbird. I have in my own collection, and have seen in others, missel thrushes' eggs bearing a very close resemblance to strongly-marked specimens of the ring ouzel's eggs; and the situation mentioned is a very likely one to have been chosen either by a blackbird or a missel thrush; whtlst a ring ouzel, on the other hand, would never have built in the fork of a stunted Scotch fir; and the redwing also, as far as I can ascertain, never selects such a situation. The probability, however, seems to be that a blackbird was the real owner. The size of the eggs might be caused by their being the produce of a young bird, and the trifling variation in the materials of the nest from those usually used may, I fancy, be ascribed to local causes. Mr. Atkinson has, I see, yet to learn to what an extraordinary and puzzling degree the eggs of our common birds vary. I may mention here, for his edification, that the eggs of the yellow bunting alone I have seen ascribed to no less than five different species, and all with a show of reason.—*Henry Smurthwaite;* 9, *Bedford Row, Barnsbury Street, Islington, July* 11, 1859.

Singular Sparrow's Nest.—Last month our gardener showed me an egg which he thought a house sparrow's, taken from a nest "queerly built." The egg was so very light and simply marked, that he had misgivings. At once we proceeded to the tree and visited the nest, which was undoubtedly "queerly built," being a kind of double tenement. From it we took three more eggs, all very large, and much longer than the one previously taken; their colour was extremely dark. Evidently they were deposited by a different sparrow. From the peculiar shape of the nest I am inclined to the belief that it was occupied, if not built, by two pairs of birds, as there appeared to be two distinct nesting corners inside; one was lined with feathers merely; the other had a few rags, and a torn page of a hymn-book, on which the eggs were lying. The nest was domed.—*G. R. Twinn; The Elms, Camp Hill, Birmingham, July 9.*

Notes on the Partridge.—On the 18th of June a friend and I were driving on the lower road from Oxford to Abingdon. On turning a corner we perceived a pair of partridges, with a brood of freshly-hatched chickens, occupying the centre of the road a little distance a-head. The herbage on either side of the road being scanty, offered but little opportuity for concealment; but the young birds made for the short grass, and, crouching down, became at once invisible. The old birds, however, waited in the road until we drove up, without seeming to evince any trepidation; and we were so much amused and astonished at their audacity that we drew up to see what they would do. The male bird ran up and down by the side of our gig, uttering a low sibilant cry, drooping his wings, and every now and then running towards our pony, as if with the intention of attacking him. The female bird remained nearly stationary by the spot where her young ones were hid, occasionally calling to them with a soft "cluck," like a hen calling her chickens. When we drove on again the male bird ran along the road before us, with his wings drooping, and his neck stretched far forward so as almost to touch the ground with his head. He evidently imagined that we were pursuing him, and thought, cunning fellow, by so decoying us on to lead us from the spot where his family was concealed. When he had led us some hundred yards or so, he triumphantly rose on the wing, and swept back to calm the fears of his wife and her young brood. Such extraordinary boldness on the part of birds generally so timid as the partridge is a proof how great a change parental *storgè* can effect upon their habits. I may also mention that a short time since I saw a partridge sitting on her eggs on a railway-bank. I was in the train at the time, and looking down saw the bird sitting quietly while the train thundered on close to her.—*Murray A. Mathews; Merton College, Oxford, June* 20, 1859.

Description of the Larva of Eupithecia coronata.—This larva is, I think, the prettiest of all the genus. It is excessively variable in colour, so much so that it was not till I had repeatedly bred the insect that I could believe that such different-looking larvæ could produce the same moth. The following are some of the principal varieties:—*Var.* 1. Ground-colour yellowish green, with three reddish dorsal lines, the centre one interrupted, and sometimes enlarged into a chain of lozenge-shaped spots, the two side ones very indistinct. Body, when closely examined, very slightly hairy. *Var.* 2. Ground-colour one uniform sea-green. The dorsal lines and spots wholly or almost entirely wanting. *Var.* 3. Ground-colour greenish yellow, with a series of rusty lozenge-shaped dorsal spots or bars. The sides and belly more or less suffused with rust-colour. Segmental divisions bright yellow. *Var.* 4. Ground-colour bright yellow, with a series of broad dull red dorsal bars, intersected and bordered by lines of the same colour. Sides and belly thickly clouded with red. This larva is somewhat different in gait and shape from those of all the other Eupitheciæ, and resembles that of H. rupicapraria. Its favourite food is the petals of Clematis Vitalba, from which plant it may be beaten in some plenty from the middle of July to the middle of August. I have also beaten it from the flowers of the hemp agrimony (*Eupatorium cannabinum*), the golden rod (*Solidago Virgaurea*), and the wood Angelica (*Angelica* *sylvestris*). The pupa, which is enclosed in a rather closely-spun earthen cocoon, has the abdomen very much curtailed and sharply pointed, the eyes black and very prominent, the thorax and wing-cases spotted with black, the latter much ribbed. The spots do not appear for a week or two after the caterpillar has turned, and till then the pupa is a uniform pale yellowish red-colour. The perfect insect appears from April to July. In confinement I have occasionally had the earlier fed July larva produce the perfect insect in August.—*H. Harpur Crewe; July* 9, 1859.

Description of the Larva of Eupithecia venosata.— This larva is by no means uncommon, though the perfect insect is seldom seen. It is also very easy to rear. It is short, thick and stumpy. Back dull leaden gray, sparingly studded with minute white spots and short hairs. Belly and sides dirty greenish white. Head black. It feeds inside the seed-capsules of the bladder campion (*Silene inflata*) and the common red Lychnis (*Lychnis dioica*), and is full-fed from the middle to the end of July. When ready to assume the pupa state it comes out of the capsule and enters the earth, where it spins a very slight cocoon, and turns to a bright red chrysalis. It is very subject to the attacks of ichneumons. The perfect insect appears from the beginning to the end of May. When quite young the larva is black.—*Id.*

Occurrence of Erastria venustula in Epping Forest. — I have met with this insect two years running, at Loughton, in Epping Forest, having taken two last year and four this. They were all taken in the month of June, flying low down among the herbage at dusk. Upon the wing they are very inconspicuous, and appear to be partial to thickets. The species would appear to be generally distributed over the Forest. Had I known the rarity of the insect I might have taken some forty or fifty; but unfortunately I, in common with most of the gentlemen who have taken it, mistook it for a Tortrix; and when I had taken enough to represent the species in my own collection I did not care to catch more. Specimens were exhibited by Mr. Eedles at the Haggerstone Entomological Society on the 14th instant. — *H. W. Killingback; 10, Oldham Place, Coppice Row, July* 14, 1859.

Note on the parasitic Grubs found in the Brain of the Harte-beest and the Gnu. — Mr. Ayres, of Natal, in a letter which I lately received from him, informs me that the "large kind of antelope, here called the Harte-beest, has invariably a number of large white maggots in the brain, each the best part of an inch long, which do not seem to affect the health of the animal at all." Captain W. R. King, in his work entitled 'Campaigning in Kaffirland,' second edition, p. 306, gives the following account of a similar phenomenon in a bull gnu, or Wilde-beest, which he shot near the Caledon River:—"We had often heard that the brain of the Wilde-beest harbours gentles or grubs, to which its wild extraordinary vagaries are by some attributed; and being anxious to ascertain the truth of such a phenomenon, the head was opened by Dr. Fayson, R.A., in the presence of a number of officers. To the disappointment of the sceptics and the astonishment of all, in the very centre of the brain, still quite warm, there was found a large maggot, which when put on the table wriggled across it with great activity." A friend of mine who was present on the occasion referred to by Captain King assures me that the account contained in that officer's work, and quoted above, is strictly accurate. Can any of the readers of the 'Zoologist' throw any light on this very curious subject? — *J. H. Gurney; 24, Kensington Palace Gardens, July* 16, 1859. [I cannot avoid feeling a doubt as to the exact site of these larvæ, which are probably those of the dipterous genus Œstrus.—*E. Newman.*]

Contributions to the Natural History of the British Vespidæ, By Edward Latham Ormerod, M.D., Physician to the Sussex County Hospital.

In the summer of 1856 I procured, through the kind and able assistance of my sisters, a small swarm of Vespa britannica with their nest, which for some weeks hung in full view outside my study window. I propose, in the following pages, to present a summary of the chief observations made on this and other swarms, which I owe to the kindness of different friends. For most valuable assistance in identifying the various species, as well by his papers in the 'Zoologist' as by personal communication, I am much indebted to Mr. F. Smith, of the British Museum, who has made the subject of the British Hymenoptera so peculiarly his own. I trust that these observations, however imperfect, may not be entirely without interest to the student of Natural History, as a contribution to a subject not less curious, though certainly less generally attractive, than the economy of bees.

The swarm, in the regular narrative of whose history my disjointed observations on other swarms have been interpolated, was discovered in the middle of June, in a hedgerow in Gloucestershire, where this species of wasp is not uncommon. The nest was then about three inches in diameter, of a globular form, very smooth, and showing few loose edges of paper on the outside, and, with the exception of one or more entrance-holes, it was completely closed at the bottom; and it was hung on a single spray, offering great facilities for its removal to a more convenient situation for daily observation.

This was effected very neatly by my sisters on a dull day, a piece of soft wet paper having been carefully applied, previous to the operation, over the entrances. In two or three days the wasps recovered themselves, and set to work to repair the injuries which their habitation had sustained. The nest grew rapidly, all the while retaining its globular form, and being always closed in at the bottom, however the form and position of the entrance-holes might vary. The ragged ends of paper, which the rain and wind loosened, were always laid down again or pared off, so as to keep the outside smooth. The nest had very much the form of a large half-blown summer rose.

With a view to its safe transmission from Gloucestershire to Brighton, the nest and its inhabitants were now transferred to a box of perforated zinc. The process, I am assured, was very exciting to those engaged in it, and the chief steps may be related here. First, the nest was enclosed in a muslin bag, and without delay removed from the dangerous neighbourhood to a room with an open window, out of which the wasps flew as the bag was taken off. The nest was then, without further difficulty, fastened in the box, and thus returned to the place whence it had been taken half an hour previously, and where the houseless family were sitting on the hedge waiting for it. I need not add that their tempers on this trying occasion were truly waspish. However, they returned to it at once, and immediately set to work to repair the slight damage it had sustained. There seemed to be altogether about three or four dozen wasps in the swarm: they were always at work, and, in spite of the injury done to the nest and the loss of some of the workers by the two journeys it had undergone, it increased an inch in diameter in the course of three weeks.

It remained only to close the box at night on the eve of its next journey, and the swarm was secured. The last step, which fell to my share—namely, to transfer the nest from its travelling case to a box outside my study window, where it could be easily and safely observed—was effected, without much difficulty, by the aid of an old gauze veil, a long pair of polypus forceps, and a large bell glass.

The wasps which were left behind in Gloucestershire claim a few lines to complete their history. When the nest was first removed from the hawthorn hedge, the stragglers which had been left there immediately set about replacing it by a new one. These stragglers were only four in number, and no wasp distinguishable by her larger size was seen among them. At first they made a rough patch of paper, adhering to the bough from which the former nest had been suspended. As this grew into a hood, of an irregularly circular form, a small tier of cells was hung from a pillar in the centre of the hood. These cells, at first four in number, were multiplied to eight during the ten days of the existence of the nest, and they had distinct eggs in them. The eggs came to nothing when the nest was brought to me at Brighton; and the four wasps, deprived of their second home, made no effort to construct another nest in this place.

Again, when the original nest was taken away from the second branch to which it had been fastened, the stragglers, who were more numerous than on the previous occasion, built another, thus making the third nest built by one colony. In less than a fortnight after its removal they had constructed, on the branch to which it had been tied, a new nest, of a flattened spherical form, measuring four inches in height, and three by four inches in width. A storm, about a week after, destroyed much of the outer case, exposing two tiers of cells, the upper one full of grubs. Unfortunately, I was unable to have any more observations made on this nest, which soon after was entirely destroyed.

But to resume. The wasps were soon reconciled to their change of quarters, and after the nest had been slung they established a sentry. But they were still tired and frightened, for they made no objection to the bottom of the nest being cut off to gain a clearer view of what was going on inside; even the sentinel paid no attention to my operations, if I was careful only to work when her back was turned. The lowest comb which was thus exposed consisted only of rudimentary cells, in which no eggs had yet been laid. Rudimentary as the cells were, still their tops were in close contact with the outer case, which must have been cut away to allow the cell-walls to be built up to their full height. Round the edges of this comb, and much more on one side than on the other, the cells of the comb above could be seen, filled with grubs, which the workers were busily engaged in feeding.

It did not appear that any distinct order was observed in feeding the grubs, but none were neglected; for not only did the little heads which were greedily thrust out from the cells receive a supply, but the nurses themselves put their heads down into all the cells to see if any nourishment was wanted by the less clamorous embryos, and the greater part of the morning was spent in running from cell to cell in this occupation. For a day or two this seemed the sole business of the swarm; for though they made themselves at home at once in Brighton, yet probably the novelty of the situation threw some difficulties in the way of obtaining a sufficient supply of food for their young, and so prevented them setting to work at once to repair the nest.

The food which was brought in was not intended exclusively for the grubs. I often saw a wasp impart the fluid contents of her stomach most amicably to her sister, directly, mouth to mouth. I could not, however, make out how the solid food which was brought in was divided, for it was carried up at once, out of sight, to the top of the nest, where the wasps usually lived.

The first duty of the day was to feed the grubs. This done, they proceeded to close in the bottom of the nest. Day by day we watched the gradual extension of a hood, shutting off the comb from observation, and closely applied over its surface, being apparently a prolongation of the innermost sheet of the case. Some of the cells in-the lowest comb were lengthened and attached to the case, but these were not otherwise materially altered, and were never further adapted for breeding-cells. Sheet after sheet was added on, to the number of five, and the nest finally was completely closed in, leaving only one small entrance-hole. But, now that the nest was protected from wind and rain by a wooden box, the wasps did not seem so careful about cutting off loose ends from the outside as they had been in the Gloucestershire hedgerow. They made all the repairs that were absolutely necessary at the bottom, but to the rest of the outside of the nest they added nothing all the while it hung outside my window.

When the nest was closed in we could of course make out little of what was going on inside, though the scraps of paper and building-pellets which lay about, and the interminable nibbling and scratching which we heard, attested to the industry of the little creatures, which kept flying in and out as busily as ever. Some insight into their proceedings, however, was obtained by the expedient of marking particular wasps, and the interest of watching the nest only ceased with the extinction of the entire colony.

Marking a wasp, like many other things, only wants a little practice to be very readily accomplished. Réaumur used to catch his wasps with a rod pointed with some glutinous matter: I made use of a glass tube, with a few inches of vulcanized India rubber and a glass mouth-piece attached to one end. In the tube was a stop to allow a free passage of air, and to prevent my sucking down the wasp. With a very little practice it was easy to catch any wasp with this instrument, and, gently blowing it out on a glove, to hold it safely while some distinctive mark in white paint was put on the thorax between the wings. By this means I often caught a wasp on the wing, or picked one out of a cluster, without disturbing the rest. But any attempt to remove the sentinel, however cautiously, was followed by a commotion which drove me for safety to the dark corner of my study.

There were ample opportunities for observing the process of paper-making during the repairs of the floor of the nest. It was precisely that which has been described by Réaumur as witnessed by him in the ground nests. Thus, a wasp, previously marked with paint between her wings, was seen to fly to the nest with an appearance of having her jaws projecting forwards. A practised eye readily recognized, by this position of the head, a wasp laden with a pellet for paper-making. On one or two occasions the wasps thus laden set to work at once, without entering the nest; but generally they flew in with their load. By marking different wasps it was shown that they did not stay more than half a minute in the nest, as if for orders; and when they emerged, after a short preliminary examination, they laid on their paper. The pellet was gradually attached to the free edge of the sheet, the wasp pressing it down with her jaws, between which it all passed. As she walked backwards, a broad black line, about three-quarters of an inch long, marked the extent over which the pellet had been spread; then she ran hastily forwards, and again walked deliberately backwards, flattening out the new soft paper into a frill; and this process was repeated some four or five times, till the pellet had been flattened out to the same thinness as the adjoining paper, from which, in a few minutes, when it had become dry, it was quite undistinguishable. Then the wasp gravely walked into the nest again.

During the process of paper-making one could approach quite close to the wasp, and even touch her without driving her away from her work. It did not appear that each wasp had her own place for paper-making, or her own end to piece on to, for we repeatedly saw one going on where a wasp had left off so short a time previously as to render it very improbable that she was the same wasp, and could have collected another pellet in the interval.

Generally speaking, the nature of the materials employed in building is almost as characteristic of the species as the form of the nest. Whatever other materials may be at hand, still each uses its own by preference, one species using bits of wood and sand gummed together, while another makes a tougher and lighter structure of vegetable fibres. I am not acquainted with the nests of V. rufa and V. borealis, but, of the other species, V. Crabro and V. vulgaris use wood and sand, and V. britannica, V. germanica and V. holsatica herbaceous filaments.

Though the materials used by the three last-named species are the same, yet the paper of V. germanica is not so firm and tough as that of the other two, apparently from the mucus employed being less adhesive. The small nests of V. holsatica and V. germanica which I have in my collection are of a singularly uniform texture, differing much in this respect from the nests of V. britannica, and giving more completely the impression of having been built by one insect, which had collected the fibres from the same source as long as the supply lasted.

Under the microscope the paper of these three species is seen to be composed of vegetable fibres of all kinds, just such as a botanist might select as specimens of the different tissues. These have apparently been all pulled singly from plants, either growing or still retaining their sap; for the paper made by these wasps strikes a dark colour on being boiled in an alkaline solution to dissolve the mucus by which the fibres are held together. An irregular kind of felting of the component fibres gives the structure additional tenacity.

The fabric of V. Crabro and V. vulgaris is made of minute fragments, not filaments, cut, rather than torn, from dry and rotten wood. With this material V. vulgaris makes a light yellow, brittle paper, which feels harsh and gritty, and crumbles under the hand into powder. V. Crabro fastens together large grains of sand and wood into a structure which is, in general arrangement, a coarse exaggeration of the paper of V. vulgaris, and owes its strength almost entirely to the dark gummy secretion in which these fragments are set, like stones in concrete. Where the structure is thick, as in the pillars, it possesses very considerable strength, but hornet paper is very friable.

The case of the nest of V. britannica is well adapted to the circumstances under which it is usually placed. Being of a dull mottled brown and gray colour, it is unlikely to attract notice; and being formed of separate sheets overlapping one another, composed of a substance not indeed impervious to water but insoluble in it, the structure is well calculated to protect the enclosed comb from any injurious effects of rain. The underground nest of V. germanica is, in its turn, equally fitted to resist the injurious influences of a wet or crumbly soil, to which it is most likely to be exposed. In the tree-wasp's nest we have unconnected sheets, overlapping one another like the capes of an old-fashioned box-coat. In the ground-wasp's the wall is made of large flattened cells, built one upon another to the thickness of half an inch or more, not affording equal facilities for drying, for indeed probably they never are dry, but capable of sustaining a greater pressure than the case of the tree-nest could bear, and giving more points of support by which the nest may be attached to the irregularities of the cavity in which it is usually built. Instead of a smooth ball, resembling a half-blown rose or a cabbage, the nest of V. germanica forms a rough dirty-looking mass, covered over with shelly patches, laid on without the slightest pretension to order or appearance. When it builds in roofs, a less usual situation, it retains the cellular mode of construction, as instinct guides it; and indeed, in a situation protected from rain, this cellular structure would answer the purpose intended quite as well as a laminated one. But the form of these cells undergoes certain modifications, according to their position in the nest and to the immediate object for which they are designed; the upper part of the case, for instance, is made of a close, compact set of cells, into which any roots or stones are worked; while the sides are made in longer channels, as being less liable to pressure, and sustaining less traction.

In a nest of V. germanica which I had under observation, where the object of the work was merely to close in a large hole which I had cut in the wall of the nest, I thought that the cells were wider and longer, and the wall altogether much slighter, than when any more substantial enemy than light had to be excluded. These wasps worked in the same way as V. britannica, and used the same materials, only, being larger, they got on faster. When making the shelly patches which closed in the cells or channels of the wall, they worked indifferently to the right or left, but always from without inwards, forming an irregular spiral, which tended towards a little hole, just big enough for the passage of the jaw of the wasp which put the finishing stroke to the work.

Réaumur, speaking of ground-wasps and hornets ('Mémoires pour l'Histoire des Insectes,' vi. p. 226), says that the nest remains open at the bottom till it has attained its full size. From my own observations of nests of V. britannica and V. germanica, of all sizes, I should say that the nest is always closed at the bottom except at quite the earliest period. No doubt this is effected at a great expense of labour, the walls having to be altered continually; but economy of labour is no object with wasps, which, like the other Hymenoptera, seem to know no rest but sleep, and, whether in the way of construction or destruction, must always be doing something.

Much perplexity has arisen from the different forms which wasps' nests assume at different periods. At an early period there is no specific mark to distinguish the nests of V. germanica and V. britannica, for they are both alike formed of overlapping sheets and open at the bottom. It is only in the cellular structure of the walls that specific differences appear. I do not know the form of the nest of V. vulgaris through all its stages, but only as the perfect nest, when it resembles the structure of V. germanica diminished in all its parts. Hornets do not seem to form the case of their nests on any uniform plan, but rather to seek such extraneous protection as may obviate the necessity of making any case at all, the numbers being fortunately fewer in the colonies of this species than in the smaller Vespidæ, and the necessity of finding something to do being consequently not so pressing.

But besides the different mode of construction of the walls of the finished nest, there are two distinct types which are displayed most characteristically in the embryo nests of tree-wasps. One of these types is illustrated in what we may call the rose-nest belonging to V. britannica, which is a rose-nest through all its stages, and the other in a bell- or bottle-nest, which I only know in the embryo form, and can only conjecturally assign to V. holsatica. These little bell-nests are very beautiful objects. The manner in which one bell hangs loosely within another, and the comb, like a clapper, inside the two or three envelopes, is very peculiar. So neat and complete are they in all their parts, that it might seem as if the little architect never designed any further enlargement of this pretty nest.

As to the internal structure, it may be said generally of all the species, so far as I have had opportunities of observing them, that they follow the same rule. The walls of the breeding-cells are made of the same material as the case of the nest, but all fresh-gathered, the cuttings of one part never being made up again into another part. The building goes on irregularly enough, a bit being put on here or there, according, as it might seem, to the taste of each builder; but the work is very regular, and hangs well together when finished; for the cells are not made separately, but each pellet is always applied in three continuous lengths, namely, on two sides of one cell, and on one side of an adjoining cell. This mode of construction may always be traced in the finished comb, and was very distinctly seen in a nest of V. germanica, where I had a large surface of comb exposed to observation. The cell-wall is single, but each cell is by this mode of construction worked into the adjoining cells, each having a distinct mucous lining of its own, the work of the grub and the plaything of the adult wasp.

But to return to our colony. As soon as the nest was closed in at the bottom, a regular watch was established at the entrance. The same wasp was often on duty for a long time together, but it was not always the same; and once, having caught the sentinel at her post to mark her, before the operation had been completed I found that the place was filled by another wasp. There she stood, with her jaws extended, just inside the door-way, running forwards to exchange compliments with each fresh-comer, or occasionally, when work was slack, taking a walk on the outside of the nest. At night I generally found one or more lying out on the nest instead of at the door, apparently on guard.

Yet all this time I believe that the swarm had no queen, the only female brought from Gloucestershire having died on the journey. Under whatever form of government, V. britannica seems much more vigilant and irritable than V. germanica, for in a nest of these I did not notice any regular system of watching. The wasps which performed the part of sentinels were commonly crippled in their wings, and very crabbed in their tempers. They ran over the nest instead of staying at the door, and seemed rather to hinder than to regulate the stream of business. But, to the credit of the working part of this swarm, it should be said that the crippled wasps were as fat and well fed as the rest; and though V. germanica be not as vigilant as V. britannica, yet it is directed by the same instinct. The workers fly straight out and straight in again, and never straggle near home. I hope my wasps were no trouble to any one else; they were never seen or heard of inside my own house, except when they entered it in pursuit of their master on some excessive provocation.

I believe that societies of wasps have no other law than the necessity of the case, except where the love of their young or such-like instincts are concerned. So in my small colony of V. britannica, where one opening was sufficient they made no more, but used this one for ingress and egress alike, contrary to what has been reported of larger swarms.

Besides those passing out on business, from time to time a wasp appeared at the door-way, merely to discharge her excretions, with which the floor of the box was generally wet. This was, as one might expect, most commonly observed in rainy weather, when the workers stayed more at home. The cleanly habits of these wasps contrasted strongly with those of a nest of V. germanica which I had at the same time in confinement; but it was the circumstance of living underground in the first instance, and subsequently of their confinement, which determined this, and not the nature of the wasps themselves; for nothing could be cleaner than a deserted nest of V. germanica which was brought me from a roof at Warbleton. I have on several occasions analyzed these excretions, but found no sugar in them, even when the insects lived entirely on honey. In this latter case they were composed of uric acid; but this is not always a constituent of the excretions of wasps.

On the 7th of August the drones began to make their appearance, but I looked in vain for any queens; though the numbers kept up, and indeed, for the safety of my neighbours, who might not feel so great an interest in wasps as I did, needed occasional reducing; and still, till September 4th, grubs of different sizes were thrown out daily.

After a very violent demonstration on the part of the wasps one sultry afternoon, their numbers were reduced by twelve, caught in the usual way by the tube; but this was the last reduction which they needed. Henceforth the numbers seemed insufficient for the duties of the nest; and, a sudden change of weather adding to their other misfortunes, the active exertions of the whole colony seemed paralyzed.

They were transferred to a new case, where they were better protected from the rain; but they seemed feeble, and now they fed on anything which was placed for them outside the nest, while when in full vigour they had rarely if ever touched anything laid in the immediate neighbourhood. Two wasps in particular, smaller than the rest, were actively employed in filling themselves with honey and flying into the nest, and from their frequent re-appearance I thought they must be employed in feeding the weaker wasps, which did not venture out.

It does not require a very long observation of wasps to feel that the general opinion concerning them is not strictly just. We know them mostly as voracious creatures, spoiling our fruit, threatening us in our beer, and on cold days crawling up the legs of our trowsers or getting into our slippers. We see them in our windows, the tyrants of the pane, if we spare them long enough, cutting up flies and daddy-longlegs, and dancing about with the dismembered trunks. But we must observe them in their nests to learn their better qualities,—their affection for their young, and their untiring industry. They do not idolize their queen as bees do, but they never neglect her, and always bring food into the nest for her. With caution and practice they may be managed to a certain extent, though their less close relation to their queen deprives us of that authority over them which we may exercise over bees. On fitting occasions they are very ready with their stings, but these are rarely used in the nest even in anger. The jaw was the favourite instrument of offence with which they assailed strange wasps, and with which they met the attacks of any wires when I wanted to do anything to the nest. I fear, however, that it might not be always safe to calculate on this habitual preference of their jaws when one's fingers are concerned.

Difference of size is very characteristic of the Hymenoptera, and is not therefore entirely to be connected with difference of age. But I think it may be said generally that the younger the fully-developed wasps are the larger they are; and, in connexion with this, it is worthy of observation that the task of building is entrusted almost exclusively to the larger wasps, as if, with their younger organs, they had a more abundant supply of the mucous secretion which binds the fibres of their paper together. To the smaller wasps are assigned the duties of nurses and police. In the nest whose history I am endeavouring to keep in view amid all these digressions, it seemed that the post of sentinel was usually allotted to small, old, experienced wasps; and in the cold, wet days, which brought the colony into the straits I have described, the two little, busy, active old wasps seemed the nurses of those that shrunk from facing the wind and rain.

In the first instance the newly-hatched wasps look small, whitish and shrivelled; but when the mealy appearance which they wear at their birth has passed away, as their down rises and exposure to the sun brings out their colours, and when they have taken their place with the other wasps, they are distinguishable by their larger size as well as brighter hues, and the smooth edges of their wings.

The difference in size of different workers of the same swarm is, however, not so considerable as it appears at first sight to be. Age or infirmity, hunger or cold, will shrink up the abdomen, on the size of which so much of the apparent size of the whole wasp depends; and a good meal, or a warm sun or fire, will make many a decrepit wasp look young again. But a real difference may be proved to exist by measuring parts which are not capable of such great distention or contraction. By the aid of the microscope I have found the limb of one wasp longer by more than a twentieth part than the corresponding limb of another wasp; and a still greater difference may be found by measuring the heads of different wasps of the same swarm.

A few more lines will suffice to convey all that remains to be told of the history of this nest. The few remaining wasps, judging from the continual nibbling and scratching, wery very busy inside, but they rarely came out of their own accord, and even when the nest was shaken only a few wasps flew lazily out. On the 8th of September I cut away the front of the nest, and discovered nine wasps only, the last remains of the colony, all workers, living a kind of bachelor or rather old maidish life between two tiers of comb. They were very sluggish, and made no attempt to oppose my operations on the nest. The warm sunlight thus let in seemed, however, to revive them, and they went on at once with their work of destruction of the comb. Moved into a box, they lingered on, fewer in number and smaller in size day by day, till September 25th, when the last of them died, having been about two months under observation.

It was interesting now to see the changes that had been going on out of sight within the nest. The lowest comb had never been completed, but had been covered in with five successive sheets of paper, the space between the comb and the case being very small and quite choked with fragments of paper. The other stages, contrary to the habit of the British Vespidæ, had been connected at their edges to the outer case, quite firmly all round, leaving only a gallery by which the wasps might mount from one stage to another. Lastly, nearly all the cells had been cut down or cleared entirely away, not merely, as is generally observed, in the upper, but in all the stages.

A very probable explanation of these deviations from their ordinary habits is to be found in the absence of a queen, and in the rough usage to which this nest had been subjected. The latter circumstance gave every inducement to strengthen the general plan of the nest in the course of repairing its frequent damages. The former not only gave a definite limit to the enlargement of the nest, but to a great degree relieved the workers from the duties of nurses, and set them at liberty to build or destroy according to their individual tastes. Not that the builders and destroyers are always two separate classes: a wasp, after building, will immediately set to work to destroy with equal zeal, cutting away some ragged end or some inconvenient projection.

All the British Vespidæ construct the interior of their nests on the same general plan; that is to say, they all build their cells, with the mouth downwards, in flat combs hanging horizontally one from the other. But the form of the cells is a little different in the comb of V. britannica from what it is in the nests of V. germanica, V. Crabro and V. vulgaris, involving certain modifications in the form of the comb. In these three the upper surface of the comb rises uniformly all round to a little central point which marks the insertion of the main support, and the direction of all the cells is parallel and vertical, or very nearly so; but the cells of V. britannica, and particularly in the small combs at the top of the nest, are made larger at the mouth than at the other extremity, so that at a short distance from the centre the radiating direction of the axis of the cells becomes very perceptible. The wasps correct this in a certain measure by elongating the cells and bending their mouths down, like a horn. Notwithstanding this correction, however, the upper surface of the comb assumes a concave form, and the cells at the circumference are sometimes directed quite horizontally, at right angles to the cells which were first built in the centre.

As the nest increases in size and weight the pillars or supports are made proportionally stronger, and their number is increased. But as each comb hangs from the one immediately above it, none of the pillars, not even the central one, being regularly continuous throughout, the increase of weight necessitates a great change in the mode of suspension of the uppermost comb from which all the rest hang. So, in a large nest additional bearings are formed for the two or three highest combs by working them into the outer case; the highest is worked entirely into the cap of the nest; the succeeding stages are only worked in at the edge, and, the cells being cut away, room is gained here for a general place of assembly for the swarm. In these large operations the little delicate egg-shell in which the colony first was housed is almost lost; but I have sometimes been able to discover its remains in the apex of the nest.

I have already expressed a doubt of the correctness of the opinion that the nest is always built and the colony founded by a single female, as far as concerns V. britannica. This doubt rests in part on some observations on a colony of this species which rebuilt their nests and laid eggs in the cells three times within periods far too short for any of these eggs to have produced wasps, and at a season too early for new queens to have been developed or impregnated. Several wasps, larger than the rest, were seen engaged in building the nests; but no single wasp was seen so much larger than all the rest as to be considered as the queen *par excellence.* These wasps had the faint rufous stains distinguishing queens of this species; and the ovaries were distinct, though not distended with eggs. So that, as far as these observations go, we may conclude that these queens were of the former year, and joint founders, though not evidently mothers, of the new colony.

I am still further inclined to accept this conclusion from the circumstance, already alluded to, of the embryo nest of V. britannica not being of an uniform colour and structure, as if it were not exclusively the work of one individual; and also from the very large number of queen grubs which are to be found in the lower combs of this species, as compared with V. germanica.

The observations thus far recorded were made on wasps in a free state, either outside my study window at Brighton or by my sisters in Gloucestershire. The strong attachment of wasps for their young makes them disregard annoyances and changes which would render similar experiments on other insects quite fruitless. But liberty is indispensable to the exercise of a wasp's faculties; and my observations on wasps in cages, for want of this, proved very unsatisfactory. Yet these negative results are not altogether without interest.

Early in the summer I placed several queens of V. germanica and V. vulgaris in a tall case, made with a division half-way down, across which a turf was laid; the spaces above and below ground being provided with all that wasps could wish for, and a free access from the lower to the upper regions being secured by notches cut in the edge of the turf. But to no purpose: the wasps flew about and fed freely, and were very sisterly one to another; but they would not build. And when they died, one after another, by a natural process or by the help of chloroform, I found a diseased condition of the respiratory organs, all the air-tubes of the abdomen being thick and opaque, matted together, containing very little air, and wholly unlike the loose transparent structures which dissection of a newly-caught wild wasp displays; but the ovaries were for the most part distinct, and distended with developing eggs; and I suppose that only liberty was wanting for a free use of their wings to have converted each of these queens into the mother of a thriving colony, could I only have been sure that they would have built in the place I had prepared for them; but I never saw any more of one which I released after having familiarized her with the spot. With no family cares to recall her to my study window, she preferred to seek a home elsewhere.

It was not to be expected that they would undertake the charge of a nest already begun, and nurse the young grubs. In the absence of such care I have never succeeded in rearing wasps from grubs, or even from nymphæ. The grubs will eat honey and water readily enough; but after a few days their movements become less active, and they die. This might be due in part to the less regular and later hours of the artificial feeding; but there was something in the nursing of the wasps which the grubs needed, and which I could not supply. It does not seem to make much difference in the hatching whether the cells are in the natural position; for a broken comb, laid with its face upwards, under the care of its rightful owners, became a very thriving colony. But the care displayed in covering in the exposed comb seemed to show that an uniform temperature and the exclusion of light were necessary to the well-being of little wasps; and for want of these attentions nymphæ which had just finished weaving the silk caps of their cells died inside them, and others which were almost ready to hatch died without coming forwards. The grubs, however, do hatch often enough to make it very unsafe to leave a fresh piece of comb lying about the house.

My attempts to study wasps in confinement at a later stage were more successful. A small nest of V. germanica, with six stages of comb, was got out of a bank at Cheam, and safely transferred to the glass case. By the time that the nest had been slung, and a large piece cut away so as to display the inside of the nest, the swarm was reduced to three, namely, two workers and one queen. However, they soon began to multiply, and before long I could count as many as sixty at once, a large number of them being drones, which appear to be hatched at a later period by this species than by V. britannica.

But wasps in confinement are very dull and tame compared with wasps in a wild state. They lingered on till the end of January, when the last survivor died; but they never made any paper; they merely vegetated. They seemed always made comfortable by having the glass case in which they lived washed out, and never molested me in doing this, though the process was repeated almost daily for several weeks.

I thought that they knew me; perhaps it was that I knew them, and was very careful never to shake the nest in my operations; for, gentle as they seemed at other times, even allowing me to handle them, the true waspish spirit came out on one occasion, when the nest had been accidentally displaced from its fastenings by a fall. They were so furious against the wire with which I was replacing it, that I was very glad that the glass had not been broken by the fall, and my angry pets turned loose into the room to find me occupation for a long winter evening in catching sixty wasps.

E. L. ORMEROD.

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

July 4, 1859.—Dr. GRAY, President, in the chair.

Donations.

The following donations were announced, and thanks ordered to be given to the donors:—'Proceedings of the Royal Society,' Vol. ix. No. 34; presented by the Society. 'Farm' Insects; being the Natural History and Economy of the Insects injurious to the Field-crops of Great Britain and Ireland, and also those which infest Barns and Granaries; with suggestions for their destruction.' By John Curtis, F.L.S., &c. Part I.; by the Author. 'The Zoologist' for July; by the Editor. 'A Manual of British Butterflies and Moths,' No. 33; 'The Entomologist's Weekly Intelligencer,' Nos. 141 to 144; by H. T. Stainton, Esq. 'The Athenæum' for June; by the Editor. 'The Journal of the Society of Arts' for June; by the Society. 'The Literary Gazette' for June; by the Editor. 'Exotic Butterflies,' Parts 30 and 31; by W. W. Saunders, Esq.

The following works were announced as having been recently purchased for the Society's Library:—Olivier, 'Entomologie,' 8 Vols. Boisduval and Guenée, 'Species Général des Lepidoptères,' 7 Vols. and 7 Fasciculi of Plates. Fabricius, 'Systema Antliatorum.' MacLeay, 'Annulosa Javanica,' Part I. Martyn's 'Spiders.' Walckenaer, 'Faune Parisienne, Insectes,' 2 Vols. 'Zoological Journal,' 5 Vols. Spinola, 'Essai Monographique sur les Clérites,' 2 Vols. Guérin-Méneville, 'Iconographie du Règne Animal, Insectes.' Redtenbacher, 'Fauna Austriaca der Käfer.'

Election of a Member.

W. D. Crotch, Esq., Uphill House, Weston-super-Mare, was balloted for and elected a Member of the Society.

Exhibitions.

Mr. Jeakes exhibited a specimen of Arrhenodes maxillosus, *Oliv.*, a North-American Curculio of the family Brentidæ, but which had been found flying in a garden at Camden Town by Miss Jeakes.

Mr. Bond exhibited some Lepidoptera taken at Freshwater, Isle of Wight, amongst which were beautiful varieties of Setina irrorella, a series of an apparently new species of Coleophora, Cochylis flaviciliana, &c.; he also exhibited a splendid living specimen of Calosoma sycophanta, found on the coast at Freshwater a few days previously, and had since been fed on the larva of Biston hirtarius, of which it devoured three or four full-grown examples daily.

Mr. Shepherd exhibited specimens of Deleaster dichroa, lately taken near London.

Mr. A. F. Sheppard sent for exhibition two specimens of Erastria venustula, taken near Loughton, Essex.

Mr. Janson exhibited the following species of Coleoptera, hitherto unrecorded as British, *viz.*, Stenus opticus, *Grav.*, from Mr. Jeakes' collection, taken by Mr. Squire in Horning Fen; Conosoma pedicularium, *Grav.*, from Holme Fen; and Scolytus Pruni, *Ratz.*, taken near London.

Mr. Mitford exhibited a fine series of Psyche fusca, which he had lately bred from the larvæ taken near Hampstead; and a specimen of Carabus intricatus, found near Bath, being a new locality for this fine species.

Mr. Holdsworth exhibited the nest and eggs of Hydrous piceus, from the aquarium of the Zoological Society, in the Regent's Park.

Mr. Gorham exhibited specimens of Anchomenus livens, taken near Eltham, in Kent, on sugar placed on trees to attract Noctuæ.

Mr. Stevens exhibited an apparently new species of Phycita, taken near Mickleham; and some beautiful Lepidoptera, chiefly Tineina, sent from Moreton Bay, by Mr. Diggles; also the drawing of the larva of a species of Gastrophasia, *Guén.*, and the moth reared therefrom.

Mr. Stevens also exhibited both sexes of the splendid Ornithoptera alluded to by Mr. Wallace in the letter read at the last meeting of the Society; and also both sexes of the beautiful Papilio allied to P. Ulysses, for which Mr. Wallace proposed the specific name of "Telemachus," which had arrived in this country since the last meeting. He observed that the Ornithoptera, although allied to O. Tithonus, *DeHaan*, was by no means identical with that insect, as had been conjectured by Mr. Westwood, from the description given in Mr. Wallace's letter.

18 OC 59

CONTENTS.

Proceedings of Societies.—Entomological Society, 6617.

Crustacea.—The Crab and its Allies, *C. Spence Bate, Esq., F.L.S.*, 6622.

Birds.—A List of the Birds of Banffshire, accompanied with Anecdotes, *Thon*
Edward, 6631. Warbling Parraquet breeding in England, *Eliza Anne Eeles*, 66
Suggestions as to the Eggs mentioned by the Rev. J. C. Atkinson, *Henry Smur*
waite, Esq., 6638. Singular Sparrow's Nest, *George R. Twinn, Esq.*, 6638. No
on the Partridge, *Murray A. Mathews, Esq.*, 6639.

Insects.—Description of the Larva of Eupithecia coronata; Description of the La
of Eupithecia venosata, *Rev. H. Harpur Crewe, M.A.*, 6639, 6640. Occurrence
Erastria venustula in Epping Forest, *H. W. Killingback*, 6640. Note on the pa
sitic Grubs found in the Brain of the Harte-beest and the Gnu, *J. H. Gurney, E*
M.P., 6640. Contributions to the Natural History of the British Vespidæ, *Edw*
Latham Ormerod, M.D., 6641.

Proceedings of Societies.—Entomological Society, 6655.

Errata.—In the Rev. Mr. Crewe's description of the larva of Eupithecia assimil
(Zool. 6579), line 4, there should be a full stop at the word "species," the follow
sentence commencing "Of many of these." In line 8, "a" before "certainty" sho
be omitted. In line 18, "Segments of rings" should be "Segmental rings."

Post 8vo, 7s., cloth,

A GUIDE TO THE QUADRUPEDS AND REPTILES
EUROPE; with Descriptions of all the Species. By LORD CLERMONT.

John Van Voorst, 1, Paternoster Row.

Now ready, price 10s. 6d.

CYBELE BRITANNICA;
OR
BRITISH PLANTS
AND THEIR
GEOGRAPHICAL RELATIONS.
BY
HEWETT COTTRELL WATSON.
VOLUME FOURTH.

N. B. This fourth volume concludes the work, and is devoted to gener
views and remarks, along with tabular summaries and arranged lis
adapted to show the phyto-geography of Britain under various aspects.

LONDON: LONGMAN AND CO.

E. NEWMAN, PRINTER, DEVONSHIRE STREET, BISHOPSGATE, N.E.